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A PRELIMINARY AUDIT OF PRACTICE - ANTIBACTERIAL PROPHYLAXIS IN GENERAL SURGERY IN AN INDIAN HOSPITAL SETTING

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Abstract: As a major proportion of antibacterials used in hospital practice are for surgical prophylaxis, an audit of practice in relation to antibacterial prophylaxis in general surgery was undertaken over a four week period in a teaching hospital to assess the extent to which principles governing surgical antibacterial prophylaxis were practised and to provide a feedback to the clinicians. The extent of use of anti-bacterial agents in surgical prophylaxis was 90%. The timing of administration was more than 2 h before surgery in 21% of the cases. Intravenous route was used in 97% of the cases. The duration of prophylaxis was more than 72 h in 48% of cases. Cefazolin was the most frequently prescribed either alone or in combination with metronidazole. The study indicated inappropriateness in the timing and duration of administration of surgical antibacterial prophylaxis.

Key words: surgery prophylaxis antibacterials

INTRODUCTION

A major proportion (30-50%) of antibacterials prescribed in hospital practice are for surgical prophylaxis to prevent postoperative wound infection (1,2). The principles governing such prophylactic use of antibacterials stress on the choice of the antibacterial, the route of administration, the timing of prophylaxis, the duration of antibacterial cover and cost effectiveness. The choice of the antibiotic depends on the pathogenic organisms likely to be present in the operative field at the time of surgery. The route, the timing and the duration of administration should all be so designed as to achieve high tissue levels of the antibacterial agent(s) at the time of surgery without inducing toxicity or facilitating the emergence of resistant organisms (3). Randomized, prospective, controlled trials have often found non-adherence to the principles governing surgical antibacterial prophylaxis and a feed-back to the clinicians has altered their prescribing practices and improved the quality of patient care (3, 4). Hence, we undertook an audit of practice in relation to antibacterial prophylaxis in the department of general surgery in an Indian hospital to assess the extent to which the principles governing surgical prophylaxis are practiced and to provide a feedback to the clinicians.

METHODS

The study sample included all the operations conducted over a four week period (17 September 1992 - 14 October 1992) in the department of general surgery (comprising of three units), St. John's Medical College Hospital, a tertiary hospital in Bangalore, South India. A member of the investigating team filled in a standard proforma at the time of discharge for each patient who underwent surgery during the study period. The proforma included details of the use of antibacterial prophylaxis - the choice of the antibacterial; the timing of administration; route of administration; the duration of antibacterial cover provided. The results were analyzed as per the following indicators: a) timing of

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administration of prophylaxis before surgery (4, 5) - within 2 h or more than 2 h, b) route of administration, c) duration of administration after surgery (2) - less than 72 h or more than 72 h and d) choice of the antibacterial. The nature of surgery was designated clean, clean-contaminated or contaminated according to a standard surgical-wound classification system (6).

RESULTS

The extent of use of antibacterial agents in surgical prophylaxis was 90% (Table I). The prevalence of use was 100% in contaminated, 88% in clean contaminated and 90% in clean surgeries. Timing of administration of anti-bacterials was within 2 h before surgery in 79% of the cases and more than 2 h before surgery in 21% of the cases. Prophylactic agents were given by iv route in 96% of the cases. The duration of administration was less than 72 h in 52% of the cases. Of the antibacterials used alone for prophylaxis, cefazolin in 35 cases and ampicillin in 7 cases were the most commonly used (Table II). Among combinations, cefazolin with metonidazole was the most frequently used (9 cases).

TABLE I : The pattern of use of surgical prophylaxis.

Indicators	*No. of patients(%)*
Prevalence of use	
Total No. of patients	100
No. receiving prophylaxis	90 (100)
Prevalence of use in each category	
Clean surgery	43 (90)
Clean contaminated surgery	35 (88)
Contaminated	12 (100)
Pre-operative timing of prophylaxis	
Within 2 h	71 (79)
More than 2 h	19 (21)
Route of administration	
iv	87 (96)
po	3 (4)
Duration of administration	
Less than 72 h	47 (52)
More than 72 h	43 (48)

Note : Five each of clean and clean contaminated surgeries were performed without antibacterial cover.

TABLE II : Choice of antibacterial in surgical prophylaxis.

Nature of procedure	*Clean*	*Clean contaminated*	*Contaminated*	*Total*
Drugs				
Cefazolin+Metronidazole	2	5	2	9
Ampicillin+Gentamicin+Metronidazole	1	4	1	6
Cefazolin+Gentamicin+Metronidazole	1	2	1	4
Ceftazidine+Metronidazole	—	4	—	4
Ciprofloxacin+Metronidazole	2	—	—	2
Ampicillin+Metronidazole	1	1	—	2
Cloxacillin+Gentamicin	—	1	1	2
Cefuroxime+Augmentin	2	—	—	2
Cefazolin+Gentamicin	1	—	—	1
Ampicillin+Metronidzole+Ceftazidine	—	1	—	1
Cloxacillin+Gentamicin+Metronidazole	—	—	1	1
Gentamicin+Metronidazole	—	—	1	1
Cefuroxime+Metronidazole	—	1	—	1
Amikacin+Erythromycin	1	—	—	1
Cefazolin	22	9	4	35
Ampicillin	3	3	1	7
Gentamicin	1	1	—	2
Metronidazole	—	2	—	2
Ceftazidine	2	—	—	2
Cefuroxime	—	1	—	1
Cephalexin	1	—	—	1
Ciprofloxacin	1	—	—	1
Erythromycin	1	—	—	1
Amikacin	1	—	—	1
Total	43	35	12	90

Note : All drugs were given by iv route except metronidazole, erythromycin and cephalexin in one case each.

DISCUSSION

Prevalence of use: It is now a time-tested hypothesis that the incidence of post-operative wound infection, potentially caused by bacteria arising from within the patient, might be reduced by single or combination of antibacterial agents administered immediately before, during and for a short time after surgical procedures (1). The prevalence of use of prophylaxis in the present study is justified as, in many institutions, all but the most minor surgical interventions are now carried out under antibiotic cover and recent data suggest benefits for even clean surgical procedures (4, 7).

Timing of administration: In surgical practice, there is considerable variation in timing of prophylactic administration of antibacterials between institutions. Classen et al (4) have shown that the timing of antibacterials administration was critical in preventing post-operative wound infection and observed that prophylactic antimicrobial agents were often not administered at optimal time to ensure their presence in effective concentrations throughout the operative period.

Emergence of resistant organisms and occurrence of infections are least likely if antibacterials are administered within 2 h of the scheduled time of operation to assure high serum concentrations of the antibacterial at the time of surgical intervention (1, 4, 7). In the present study, review of timing of administration in the 21% of cases where administration was more than 2 h prior to surgery is called for.

Route of administration: Surgical prophylaxis is usually recommended by the parenteral route, mostly iv, for fast achievement of high plasma and tissue concentrations of the drug(s) to cover the duration of surgery at which time the risk of bacterial contamination is maximal (8). In the present study iv route was used in 97% of the cases.

Duration of administration: Short term administration of antibacterials in surgical prophylaxis is as effective as long term administration (3, 5). In the present study, 48% of the patients received prophylaxis for more than 72 h and this included 28% of the clean surgeries too. Such prolonged administration is justified only when prophylactic administration is converted to therapeutic as in cases of spillage during surgery. Animal experiments clearly show that the critical period for successful prophylaxis lies in the 4 hours following surgery (4, 8).

Choice of the antibacterial: Most post-surgical infections are due to patient's own organisms which, in hospitalized patients, may include multi-resistant bacteria. The choice of antibacterial should be guided by the knowledge of organisms causing infections within the institution and their susceptibility pattern (1). Appropriate use of prophylactic antibacterials also requires knowledge of their pharmacokinetics. The pharmacokinetics and the antibacterial spectrum of first generation cephalsoporins have prompted their wide use in surgical prophylaxis. Among the first generation cephalosporins, cefazolin because of its long half-life is usually preferred as in the present study. Use of combination of antibacterials is justified when an extended spectrum is required (2). In the present study, use of antibacterial combinations (cefazolin, metronidazole, gentamicin and ampicillin) was accordingly justified.

In this preliminary audit, the scope of enquiry was not extended to validate prescribers' decisions against antimicrobial susceptibility reports. Data generated from our proformas have been used to draw valid conclusions and provide a feedback to the surgeons. As reported elsewhere (2, 3, 4, 8), this study also indicated that most of the inappropirateness in surgical antibacterial prophylaxis pertains to the timing and duration of administration. As a follow-up to this survey, a prospective observational study may be undertaken to find out the effect of the prevalent pattern of surgical prophylaxis on the occurrence of post-operative wound infection. Intervention strategies by way of hospital antibiotic policy guidelines to prescribers may be planned on the basis of this audit to promote rational prescribing practices in surgical prophylaxis.

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